

Post-doctoral position in Le Mans

Vision methods applied to the measurement of vibrations

Context

Within Le Mans Acoustique (LMAc) consortium, experimental techniques using high-speed cameras to measure vibrations have been developed during these last years. They are inspired from stereovision methods and have been adapted to vibro-acoustics [1, 2] or even electroacoustics [3]. The obtained results are very promising. This technique is one the few that allows to perform full-field measurements and opens opportunities to characterize non-linear systems or non reproducible phenomena.

Environment

The work will be done in a two-party environnement:

1. The Acoustic laboratory of le Mans University (LAUM), in which is working one supervisor (Manuel Melon)
2. The Centre of Technological Transfer de Technologies in Le Mans (CTTM), that realize the transfer of research in acoustics in Le Mans to the industrial world. CTTM owns measurement facilities that will be very helpful for the project (supervisor: Marie-Hélène Moulet).

Work to do

In this project, the work to do is split in two main tasks:

1. **Measurement of vibrations with a pseudo-stereo vision system with light pattern projection** Until now, techniques developed in Le Mans use a pattern (targets or random patterns) which is drawn on the object of interest to recover its 3D displacement. This method can be problematic in some case (it is time consuming, can damaged the object or can add mass when using stickers). An alternative approach consists in projecting a pattern on the object. In that case, existing codes will have to be adapted to this new configuration (the pattern, is not vibrating any more but the its shape is modified by the vibrations). The new codes will be validated with comparisons to classical methods (laser vibrometer or accelerometer).
2. **Measurement of object from the industrial world** Until now, we have validated our codes to academic systems (plane aluminium plate, loudspeaker, etc.). The team supervising the project, will provide more complicated test cases that will be more linked to the industrial world thanks to the CTTM clients or partners. To do so, the measurement protocol (with or without mirrors), the corresponding algorithms, and the de camera models will be adapted to facilitate the use of the method for *in situ* configurations.

Profile

As the proposed subject combines acoustics and vision methods, applications from doctors of one of these two field will be considered. Programming knowledge in Python will be very much appreciated.

Position

- Duration: 12 months, localisation: Le Mans, France.
- Send your application letter and resume to manuel.melon@univ-lemans.fr

References

- [1] T. Durand-Texte, E. Simonetto, S. Durand, M. Melon & M.-H. Moulet, “Vibration measurement using a pseudo-stereo system, target tracking and vision methods”, *Mech. Syst. Sig. Process.*, 118C, 30–40 (2019) doi:10.1016/j.ymsp.2018.08.049.
- [2] T. Durand-Texte, M. Melon , E. Simonetto, S. Durand & M.-H. Moulet, “3D vision method applied to measure vibrations of non-flat items with a two-mirror adapter”, 13th international conference on vibration measurements by laser and non-contact technique, Ancona, June 2018.
- [3] T. Durand-Texte, M. Melon , E. Simonetto, S. Durand & M.-H. Moulet, “Vision methods applied to measure the displacement of loudspeaker membranes”, 144th AES Convention, Milan, Italy, May 2018.